## Guidance on applying Green ICT in Higher Education and Research

Hankel, A.C.; Lago, P.

***published in***
Adjunct Proceedings of the 29th EnviroInfo and 3rd ICT4S Conference 2015
2015

***document version***
Publisher's PDF, also known as Version of record

# Guidance on applying Green ICT in Higher Education and Research

Albert Hankel
Department of Computer Science
VU University Amsterdam
Amsterdam, The Netherlands
a.hankel@vu.nl

Patricia Lago
Department of Computer Science
VU University Amsterdam
Amsterdam, The Netherlands
p.lago@vu.nl

The field of Green ICT is associated with minimizing the negative environmental impacts of ICT and optimizing the positive impacts of ICT. Even though the global environmental impact of ICT itself is significant (roughly 2%), making something else more efficient has a much larger effect (potential reduction of 16% of the global footprint) [1]. While both aspects are widely recognized and can be understood on an abstract or global level, it is often difficult for individuals or organizations to apply them.

The SURF Green ICT Maturity Model (SGIMM) was created to address this issue. The SGIMM is designed to give organizations insights into the maturity of Green ICT of the organization. It is set-up as a self-assessment and enables organizations to have an internal dialogue, to gain agreement on the status quo and to define actions for improvement. By letting several individuals within an organization score the attributes and discussing these scores with the participants an organization can identify weak and strong Green ICT aspects.

The concept of the maturity model is based on the Capability Maturity Model, representing a framework with five maturity levels for quality and process improvements. The five levels are (1) initial, (2) repeatable, (3) defined, (4) managed and (5) optimizing. At the lowest level, the initial level, the organization does not provide a stable environment for the activity. At this level the process is ad hoc. However, at the highest level, which is the optimizing level, the entire organization is focused on continuous process improvement [2]. Further inspiration was drawn from the work done by Curry and Donnellan [3].

The SGIMM conceptually consists of four domains covering negative and positive impacts and aspects of ICT. Each domain consists of attributes that have a definition, factors involved and descriptions of each of the five maturity levels. Three domains and attributes are generally applicable to any organization, being: “Green ICT in the Organization”, “Greening of ICT” and “Greening of Operations with ICT”. The fourth domain is sector-specific and covers ‘Greening of primary processes with ICT’. For instance, for the higher education sector (main focus of our research), the primary processes would relate to education and research. More information on the SGIMM can be found in [4, 5].

A few models and frameworks exist that help apply Green ICT principles to primary processes in an organization. For example, the framework in [6] contains the capability building block “ICT-enabled business processes”. They found that involving the ICT department as well as ‘business’ raises awareness on both sides of the potential of Green ICT. However, the framework seems to remain high-level and offers little practical guidelines to apply Green ICT to business processes. In general the impression we gather from other work, and this is also what we experience, that it is difficult to apply Green ICT outside the datacenter.

With the poster we want to demonstrate how the SGIMM could offer practical guidance for Green ICT in primary processes. We have developed a sector-specific domain in SGIMM for the higher education sector using the principles of the maturity model described above in combination with a reference architecture that was developed for the Dutch Higher Education [7]. This reference architecture contains detailed material on processes in Higher Education that we could reuse for the maturity model.

Using the Higher Education sector-specific domain as an example, we can now define the general steps to develop such a domain. These steps can be used as guidance for other sectors, too. They are:

1. Find a well-grounded description of the sector activities and processes, for example a reference architecture. If such a description is absent, one could proceed with a description of the enterprise architecture of a single (typical) organization.

2. Identify the main primary processes or functions. For example: education. These are the attributes in the sector-specific domain.

3. Find detailed descriptions of the previously identified attributes to deduce building blocks or process categories. For the attribute ‘education’ these categories are (amongst others): teaching, examination.

4. Describe the maturity levels for each attribute. This can be done in two ways:

    a. Use general descriptions of maturity levels [2, 3] and make these more specific based on the architecture (this is what we have done).

    b. Use the identified process categories, give them individual scales of improvement and use a combination of the scales to describe each level.



 ISBN: 978-87-7903-712-0

We are currently testing the use of such a domain focusing on the primary processes in combination with the use of the rest of the maturity model by observing a number of Higher Education institutions that are applying the model in practice. One of the positive benefits already identified is that it raises awareness of the possibilities of green ICT as an enabling force, also outside of the ICT department or specialists in an organization.

***Keywords—Green ICT; Maturity Model; ICT for Sustainability***

## REFERENCES

[1] GeSI. "SMARTer2020: The Role of ICT in Driving a Sustainable Future, 2012". http://gesi.org/SMARTer2020

[2] M.C. Paulk, B. Curtis, M.B. Chrissis, and C.V. Weber, "Capability maturity model, version 1.1", Software, IEEE, 10 (4), 18–27, 1993.

[3] E. Curry and B. Donnellan. "Understanding the maturity of sustainable ICT." *Green Business Process Management*. Springer Berlin Heidelberg, 2012. 203-216.

[4] A. Hankel, L. Oud, M. Saan, & P. Lago. "A Maturity Model for Green ICT: The case of the SURF Green ICT Maturity Model". EnviroInfo 2014.

[5] SURF Green ICT Maturity Model. http://www.surf.nl/sgimm

[6] B. Donnellan, C. Sheridan, & E. Curry. "A capability maturity framework for sustainable information and communication technology". IT professional, 13(1), 33-40, 2011.

[7] Hoger Onderwijs Referentie Architectuur (Dutch). http://www.wikixl.nl/wiki/hora/index.php/Hoofdpagina. (English version: http://insite.bizzdesign.com/HORA/index.html ).



 ISBN: 978-87-7903-712-0